



# Crew Resource Management (CRM) Training Research

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# Evolution of CRM Training



- FAA's Advanced Qualification Program (AQP):
  - Data-driven, airline-specific training
  - CRM assessed at the level of behavioral markers



# CRM Research Initiatives



- 58th Special Operations Wing
  - MC-130P Combat Shadow CRM study
  - Application of MC-130P study results to improve training
  - Replication of original study with MH-53J crews
- 56th Fighter Wing
  - Survey of F-16 pilots' CRM attitudes
- Arizona Air National Guard \*
  - Using MC-130P data for advanced KC-135 tactics training
- Air Force Reserve Command \*
  - In-unit collection of CRM and mission performance data from C-5 aircrews

*\* Supporting Small Business Innovative Research (SBIR) projects to develop hand-held CRM data collection tools*



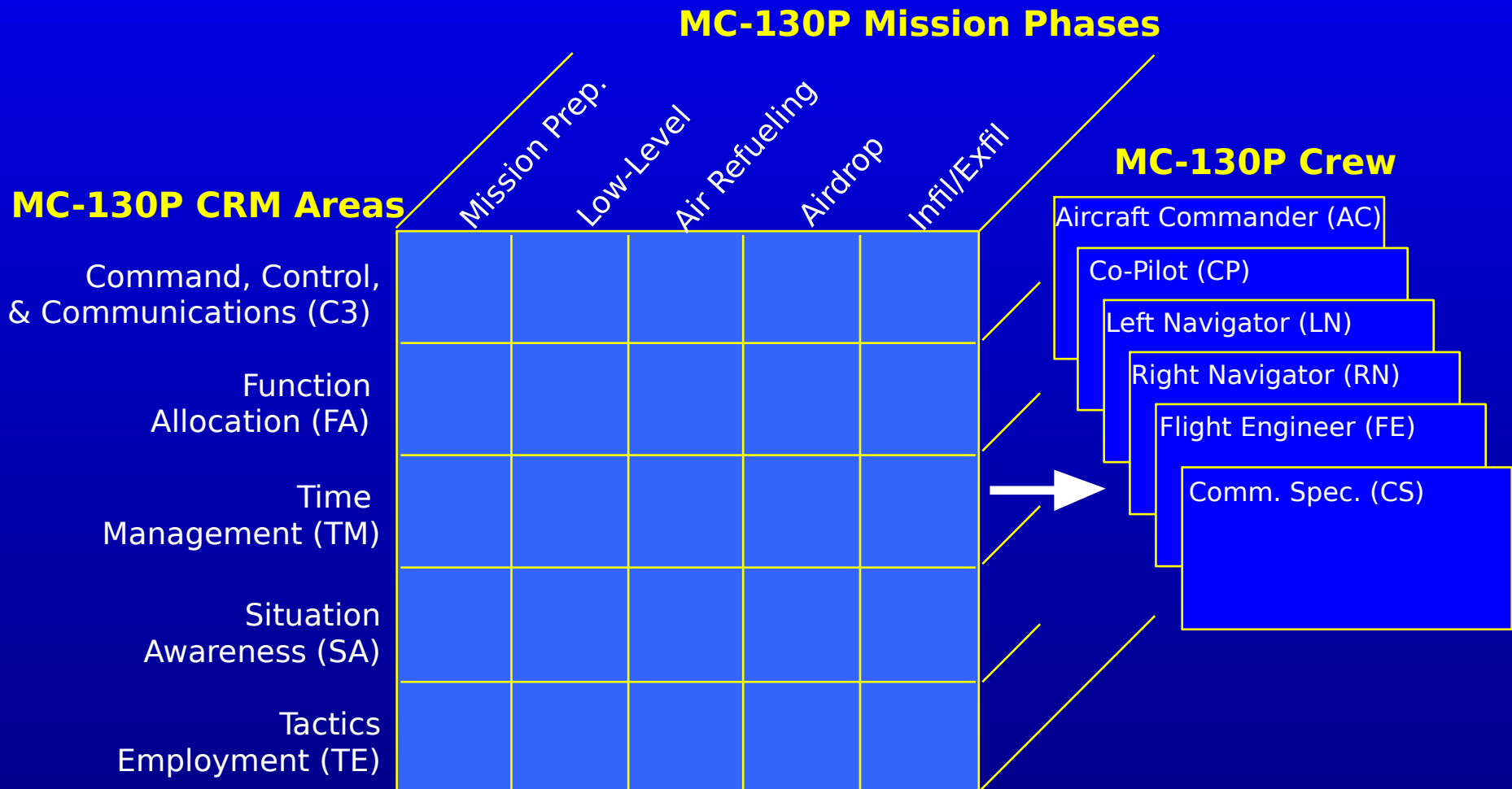
# MC-130P Study Method



- Eleven mission-qualified MC-130P crews observed during annual refresher training
  - Pilot
  - Copilot
  - Left Navigator
  - Right Navigator
  - Flight engineer
  - Communications Specialist
- Planned and executed a complex training scenario with simulated threats in the WST
- Crew process and mission performance independently rated by two separate observers

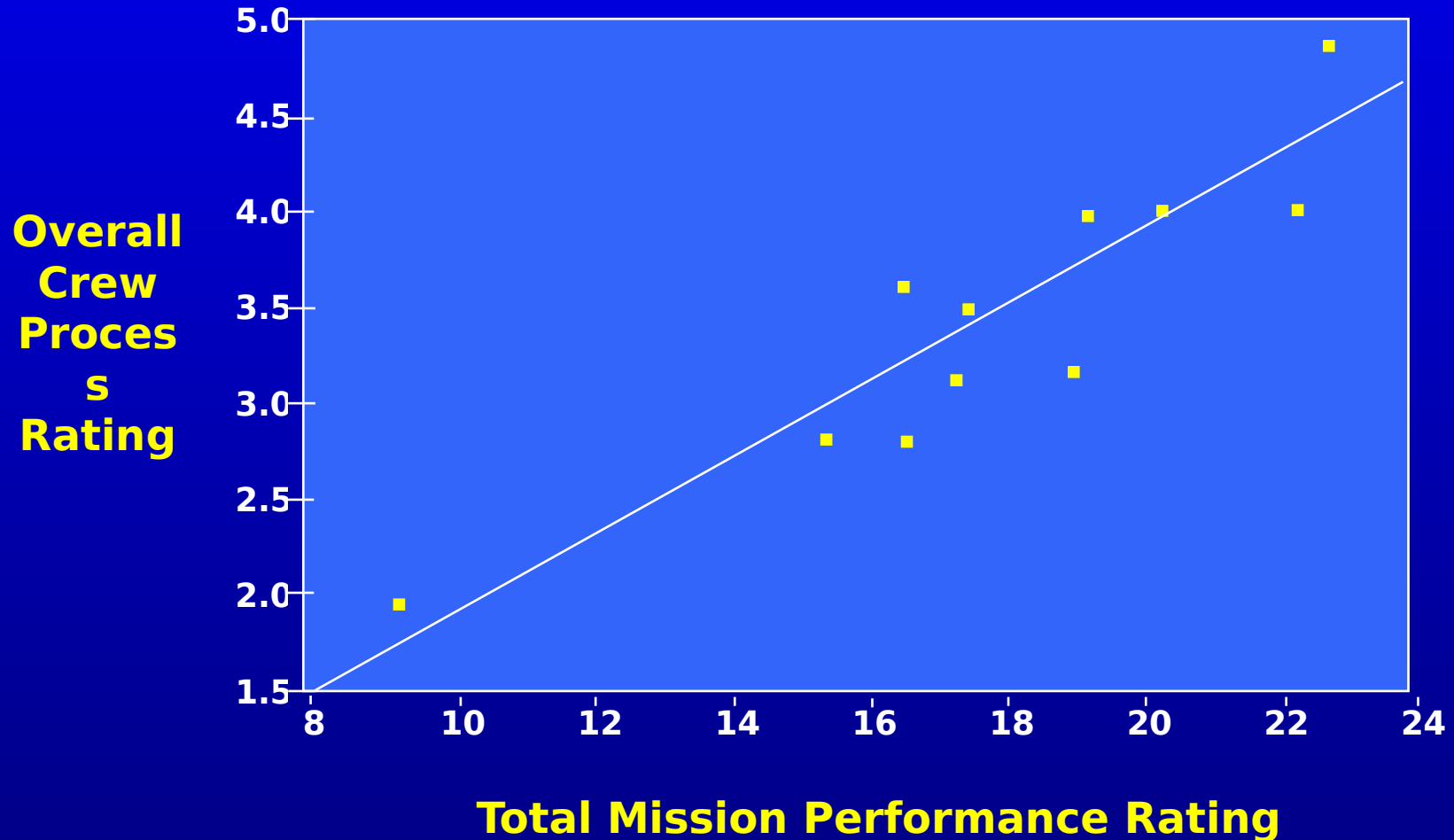


# Crew Process Data Structure



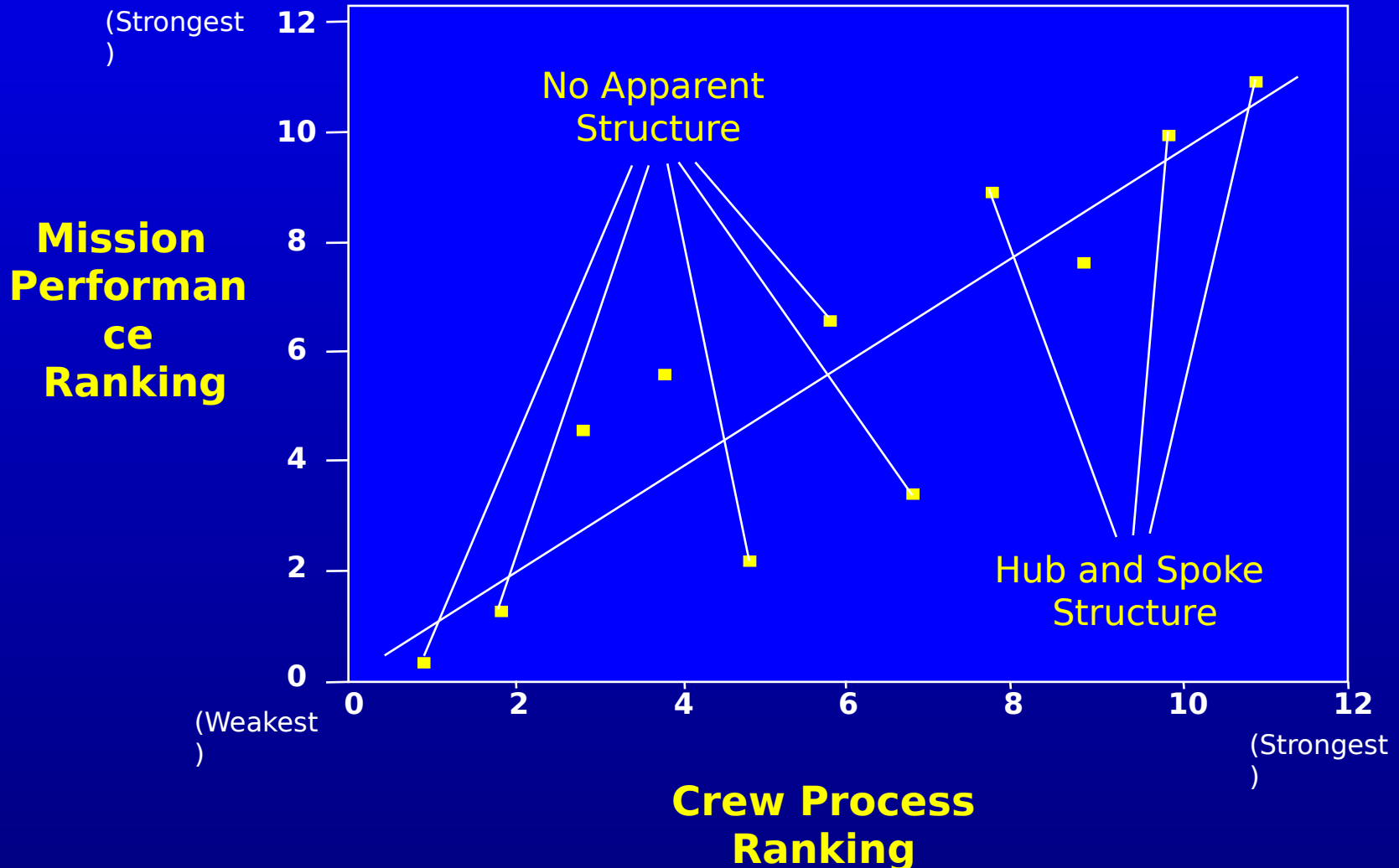


# Overall Process-Performance Relationship





# Is Crew Structure Related to Process and Performance?





# Behaviors of Effective Crews - Mission Preparation



- Total process and overall performance  $r = .86$
- Process ratings for planning highly correlated with subsequent mission performance ratings ( $r = .78$ )
- Quality and number of planning products generated correlated with mission performance ( $r = .60$ )
- A number of high-performance crew behaviors identified
  - Specific tasks distributed to take advantage of particular crewmember strengths
  - Crewmembers perform extensive “what if” analyses of mission elements
  - Crewmembers actively consider how own actions affect other mission players





# Behaviors of Effective Crews - Mission Execution



- Focal crewmember that:
  - Questions & crosschecks each crewmember's performance
  - Prompts to correct crewmember errors
  - Reacts to changing mission environment
- Crisp and “in-sync” internal crew checklists and communication protocols
- Plans are altered in response to changing tactical situation
- Information requirements are coordinated with other crewmembers as needed



# Study Conclusions



- CRM can be observed and analyzed when defined in terms of concrete behaviors
- Good CRM leads to strong mission performance
  - CRM accounted for 75% of the variability in mission performance
- Planning is an important part of the mission and CRM is an important part of planning
  - CRM during planning accounts for 60% of mission performance
- Effective crews exhibit characteristic CRM behaviors, most of which are not currently trained



# Reactions from Aviators and Scientists



- **58 TRSS** is turning recommendations into direct training changes
- **550 SOS** instructors and evaluators endorse data-based CRM instruction throughout training
- **Air Staff** used results to revise CRM training policy
- **ANG KC-135** applying results in a new advanced tactics training course
- **AFRES B-52** applying results in a new mission planning training course
- ***Best Paper*** award at '97 I/ITSEC



# Improved MC-130P CRM Training



- Data-driven CRM courseware for MC-130P Mission Qualification is expected in early CY 1999
  - MC-130P study data
  - Flightline training records
  - Instructor inputs
  - Stan/Eval trends
- Overall goal: Impact crew behavior on the flightline
  - Impacts of new training approach will be evaluated
- AFSOC/DOT and AF/XOOT intend to use MC-130P approach as a model if proven successful



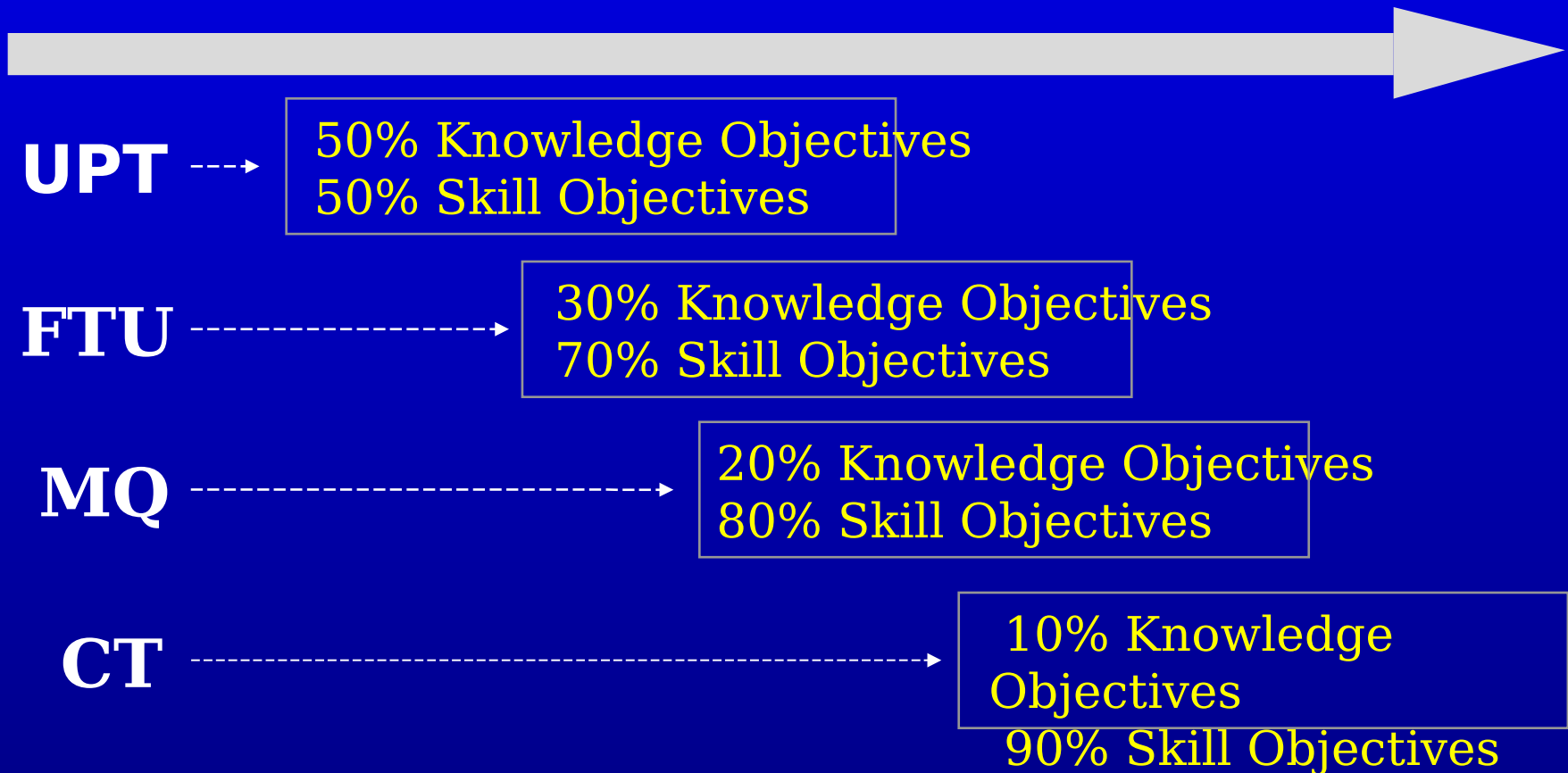
# AFI 11-290 View of CRM Training Requirements



**Awareness**

**Application**

**Mastery**





# MC-130P CRM Courseware



- Course builds on previously-learned CRM foundations
- Training objectives reflect desired behaviors, not recalling lists from memory and defining terms
- A majority of CRM content integrated into other course elements
- Training addresses both effective behaviors to be modeled & ineffective behaviors to avoid
- Effective mission planning emphasized
- Content specific to MC-130P mission operations
- CRM instruction spans academic, simulator & flight training



# CRM Training Issues



- Incorporating CRM into training
  - CRM needs to permeate all phases & all media of training (including flight operations)
- Providing CRM data to address problems
  - Identify crew performance problems
  - Incorporating AF Form 4031 skills criteria into flight checks
  - Determine effectiveness of training programs
- Distributed Mission Training (DMT)
  - Provide skills-based mission team training across networked simulator systems